DOCUMENT RESUME

ED 416 839 IR 018 736

AUTHOR	Tyan, Nay-ching Nancy; Hong, Frank Min-chow
TITLE	When Western Technology Meets Oriental Culture: Use of Computer-Mediated Communication in a Higher Education Classroom.
PUB DATE	1998-02-00
NOTE	27p.; Paper presented at the Annual Meeting of the Association for Educational Communications and Technology (St. Louis, MO, February 18-22, 1998).
PUB TYPE	Reports - Descriptive (141) -- Speeches/Meeting Papers (150)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	*Computer Mediated Communication; *Computer Uses in Education; *Constructivism (Learning); Cooperative Learning; Foreign Countries; Higher Education; Likert Scales; Non Western Civilization; Questionnaires; Student Attitudes; Student Surveys; Teaching Methods
IDENTIFIERS	*Collaborative Learning; Learning Environments; Taiwan; Technology Integration; *Virtual Classrooms

ABSTRACT

A computer-mediated communication (CMC) device, Virtual Classroom & Virtual Corporation System (VICTORY) was developed and integrated into a Taiwan higher education classroom with the aim of providing a constructive learning environment where high-quality instructional interactions and true collaboration existed among learners. Individual students were required to participate in an electronic forum before face-to-face-discussions took place in the actual classroom. The electronic forum was the virtual classroom component of the system. This paper first reports typical communication patterns in Taiwan traditional classrooms. Literature on collaborative learning, constructivism, and CMC is reviewed. VICTORY and its integration into a business policy class at National Taiwan University are described, and results of a questionnaire survey of students' satisfaction with CMC are discussed. Recommendations to educators who wish to integrate CMC and constructivism in their classroom teaching, as well as to educators who wish to conduct CMC and constructivism-related research, are provided. The 19-item Likert scale questionnaire is appended. (Contains 20 references.) (Author/MES)

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When Western Technology Meets Oriental Culture: Use of Computer-Mediated Communication in a Higher Education Classroom

Dr. Nay-ching Nancy Tyan

Associate Professor
National Taipei Teachers' College
Email: ntyan@tea.ntptc.edu.tw

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Dr. Frank Min-chow Hong

Professor
National Taiwan University
Email: Minchow@handel.mba.ntu.edu.tw

Paper presented at 1998 AECT-InCiTE national convention
(Sponsor: Association for Educational Communications and Technology)
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Dr. Nay-ching Nancy Tyan

Associate Professor
National Taipei Teachers' College
Email: ntyan@tea.ntptc.edu.tw

Dr. Frank Min-chow Hong

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Abstract

A Computer-Mediated Communication (CMC) device, Virtual Classroom & Virtual Corporation System (VICTORY) was developed and integrated into a Taiwan higher education classroom with an aim to provide a Constructive learning environment where high-quality instructional interactions and true collaboration existed among learners. Individual students were required to participate in an electronic forum before face-to-face discussions took place in the actual classroom. The electronic forum was the virtual classroom component of the system. The class (undergraduate students in their senior year) was challenged by the professor to work together as a team in order to publish a book of this novel learning experience and the knowledge they collaboratively constructed. That was the virtual corporation function of the system. By the end of 1997 spring semester, two books were published on the Taiwan market (Business Policy class of spring 1997, 1997; Hong, 1997a). They reported, from the students' and the professor's perspectives, the learning process which occurred in and the learning product which resulted from VICTORY as a Constructive learning environment. The ideas and practices contained in these two books had stimulated tremendous responses in the field of higher education in Taiwan.

This paper first reports typical communication patterns in Taiwan traditional classrooms. It reviews literature on collaborative learning, Constructivism, and Computer-Mediated Communication. It then describes VICTORY and its integration in the second author's Business Policy course at National Taiwan University. Analysis results of the questionnaire survey of students' satisfaction with CMC are discussed. Recommendations to educators who wish to integrate CMC and Constructivism in their classroom teaching as well as to educators who wish to conduct CMC and Constructivism related research are provided at the end of this paper. The 19-item Likert scale questionnaire is included in the appendix.

Keywords: Computer-Mediated Communication, Collaborative learning, Higher education, Classroom teaching

When Western Technology Meets Oriental Culture: Use of Computer-Mediated Communication in a Higher Education Classroom

The purpose of this paper is to report, from the perspective of Constructivism, the integration of Computer-Mediated Communication (CMC) in a Taiwan higher education classroom. The background of this research, the communication pattern in Taiwanese higher education classrooms, is first depicted.

The communication pattern in Taiwan higher education classrooms

Communication between Professor and learners

According to the writers' teaching experiences and long-term observations (Note 1), the typical communication pattern between the professor and the learners in Taiwan undergraduate classrooms is that of one-way communication, i.e., from the professor to learners as an intact group. Most students come to the classroom with expectations that the professor is responsible for preparing, synthesizing, organizing and presenting the content, while they are responsible for taking notes and later memorizing notes for the test. Very rarely does individual learners conduct meaningful discussions on the learning materials with the professor in the classroom. Even more rarely do learners interact with the professor out of the classroom. Professors' office hours are usually passed without student visits. The communication pattern is represented in figure 1.

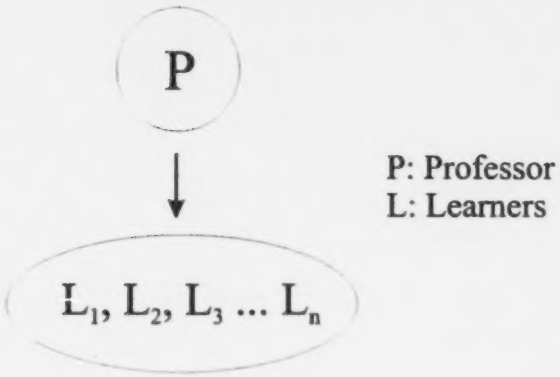

Figure 1. Professor tr. nsmits knowledge to all students as an intact group

Communication among learners

There are usually some communications among learners themselves. Most of them are of social nature. If the instructor adopts a paper-and-pencil type of test or if the instructor does not assign any group project, students tend to become solitary learners. This pattern of solitary learning is portrayed in figure 2.

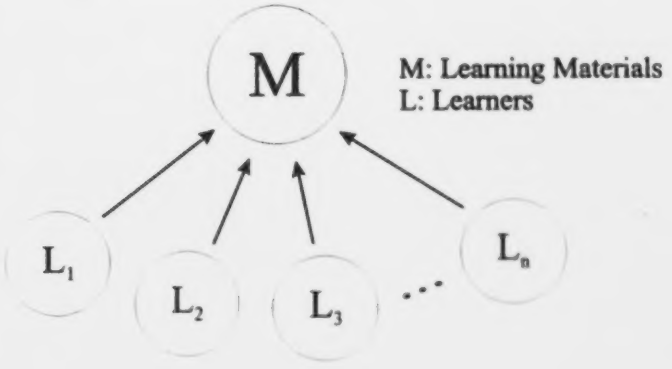

Figure 2. Individual learners try to master learning materials on their own

If the instructor deliberately assigns group projects (e.g., conducting a questionnaire survey and writing a research report), then it is more likely for learners to have instructional interaction outside the classroom. Even so, they usually tend to hold meetings at the beginning of the project, in which they will list tasks need to be done and then divide the tasks among themselves. Every student is responsible for a small piece and finishes the task individually. Thus, the group project ceases to remain a group project. Students transformed it into a series of individual tasks. Each student being responsible for his own share. Interactions among learners are reduced to a minimum, just enough to get the work done. When asked why not work in a more collaborative way (i.e., group discussion, mutual critiques of each other's work, etc.), students always claim their approach is much more efficient and is most suitable for their busy schedules. The nature of this assembly line approach is illustrated in figure 3.

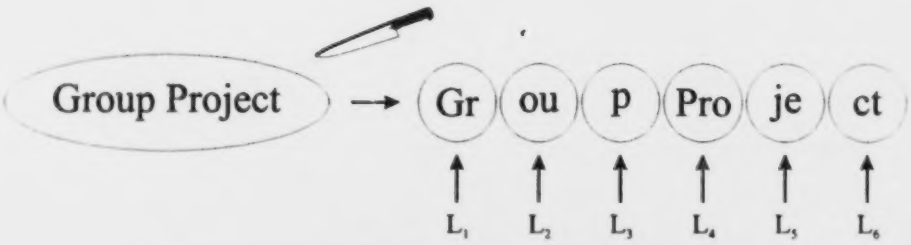

Figure 3. Assembly line approach to group project

This lack of instructional interaction and meaningful collaboration has been of increasing concern to local Constructivist educators who strive to create a learning environment where there are high-quality instructional interactions and true collaboration, because it is through these interactions and collaboration that learners construct their knowledge structures. (Chiu, 1996; Chou & Sun, 1996; Tyan, 1996a, 1996b).

Collaborative learning from Constructivist perspective

Constructivists, such as Goodman (1984), believe that the very world we

live in is "created" by the mind. Rorty (1979) argues that there is no way to account for the validity of knowledge; rather we justify our knowledge through a social process, an extended conversation (Gardner, 1985). In other words, knowledge is the product of people through collaborative and negotiative activities.

In the field of psychology, Piaget derived theories for constructing knowledge from his close observation of children, a developmental perspective. Children make and remake their basic concepts and logical thought-forms that constitute intelligence. Piaget prefers to say that the child is inventing, rather than discovering ideas (Bovet et al., 1989). For the most part Piaget focused on the cognitive conflict brought about by the disequilibrium that occurs as an individual acts on the physical and logical environment. Cognitive conflict could arise in the course of social interaction, in discussion with other children who hold different views on an intellectual issue. Such discussions allow children to see that there is a different perspective that may not easily fit into their own preexisting perspective. Piaget emphasizes collaboration as the ideal form of social interaction promoting cognitive development.

Vygotsky's theory was built on the premise that individual development can not be understood without reference to the social milieu, both institutional and interpersonal, in which the child is embedded. Human beings are inherently social, mediated by the cultural context in which they live (Tudge et al., 1989). This collaboration by a community of learners is seen as indispensable for cognitive growth. Vygotsky (1978) proposes a concept, "zone of proximal development" (ZPD), for understanding the social interaction nature of learner's development. In social interaction in the ZPD, learners are able to participate in more advanced learning activity than they are capable of independently, and in doing so they practice skills that will be internalized to advance what learners can do independently.

Fosnot (1989) recommended that students need to be immersed in an environment where they are engaged in questioning, interacting, investigating, collaborating and negotiating. It is believed that through this kind of learning activities, students would be able to move from dualistic views (right vs. wrong) views to multiple, relativistic views, what Perry (1970) described as a scheme of cognitive development in higher education.

Collaborative learning and Computer-Mediated Communication (CMC)

During the past several years, hardware and software advancements have opened the door for using the powerful computing resources available in order to facilitate learning. One such advancement is the explosion of available computer networks. The widespread availability of these networks has altered the way many students and instructors communicate. Computer-Mediated Communication via electronic mail (e-mail) and World Wide Web (WWW) have provided a new communication medium for students and instructors (Holden & Mitchell, 1993).

Computer-Mediated Communication (CMC) refers to the use of networks of computers to facilitate interaction among instructor and learners who are separated by time and/or space. The power of CMC as Constructivist learning tools and environment lies in their capabilities to support collaborative learning (Harasim, 1990; Kubota, 1991; Jonassen, et. al., 1995; Heflich, 1996).

Learners can work together to solve problems, argue about interpretations, negotiate meaning, or engage in other educational activities including coaching, modeling, and scaffolding of performance. Learners are electronically engaged in discussion and interaction with peers and experts in a process of social negotiation. Knowledge construction occurs when students explore issues, take positions, discuss those positions in an argumentative format, and reflect on and re-evaluate their positions. As a result of contact with new or different perspectives, these activities may contribute to a higher level of learning through cognitive restructuring or conflict resolution, leading to new ways of understanding the material (Harasim, 1990). Sharing knowledge through CMC also aids the overt exchange of naturally covert processes and strategies with other learners in order to solve collective or individual problems. These exchanges can be viewed by all learners and contribute to the formation of a collaborative mental model in a specific subject area.

Business Policy & VICTORY

Virtual Classroom and Virtual Corporation System (VICTORY) was developed and utilized by the second author and his research assistant, Woody Wang (Note 2), for the Business Policy course in the spring semester of 1997. The major technologies employed include electronic mail (e-mail) and World Wide Web (WWW). VICTORY is a Constructive learning environment that supports collaborative learning. (Hong ,1997a, 1997b). Though this study was not the first one in the field of higher education to integrate CMC to create virtual classrooms, it did distinguish itself from other applications by its virtual corporation function. These undergraduate students, worked together like a virtual corporation and collaboratively published a book on the market by the end of the semester (Business Policy class of spring 1997, 1997)! This book not only contained the profiles of the business case studied, but also records of students' discussions on WWW and in the class. Readers can see clearly how these students formed their own positions, questioned other opinions, defended or modified their views when challenged, negotiated with their classmates as well as other educational activities, such as coaching, modeling and scaffolding from the professor. Reporting, from the students' and the professor's perspectives, the learning process happened in and learning product resulted from VICTORY as a Constructivist learning environment, this book as well as Hong's book (1997a) had stimulated tremendous responses in the field of higher education in Taiwan. The course, Business Policy, and the application of VICTORY are described below.

Business policy

Course description

Business Policy was a three credit hour course offered at the spring semester to all senior students at the department of Business Administration, National Taiwan University. In the spring of 1997, 59 students took this course as a requirement of their Bachelor degree. The goal of this course was to provide students opportunities to experience the strategy making process when facing significant issues (e.g., entering or drawing back from a certain market, organization reform, technology revolution) by synthesizing

all they had learned in previous semesters. It was hoped that through these higher-order cognitive exercises (analysis, synthesis and evaluation), students would be able to correct and sharpen their thinking logic, construct their analysis framework, and thus improve their abilities to solve business problems as well as their communication and self-expression capabilities.

Instructional method

The instructor adopted case study as the major instructional method. A total of nine business case profiles were collected and developed for students to study and discuss. Due to the unique background and current status of Taiwan's business, trade and industry, the cases selected included domestic and international ones. It was hoped that through the close examination of domestic cases, students would be able to explore the perspectives of strategies for local firms. Foreign cases were also introduced for three reasons. First, it was hoped to provide students with well-known international examples. Second, they were included to expand students' strategy thinking experience. And last but not the least, it was hoped to equip students with managerial skills necessary for future executives, so students will be better prepared to face international competition. These cases included the PC industry, the Electronic Commerce industry in Taiwan, ACER, Southwest Airline, Wal-Mart stores, Inc., Marks & Spencer, Nike, Intel and Microsoft.

Evaluation

For each case, individual students were required to electronically participate in out-of-class discussions via email or on WWW. This is the Virtual Classroom part of the VICTORY. In addition, students also had to participate in face-to-face in class discussions. Students' performance in virtual classroom and real classroom discussions each accounted for 50% of the grade. They were evaluated based upon their quantity and quality. The entire class was clustered into nine groups, each responsible for one case. They had to synthesize the discussions among students and the professor on the case, and write one chapter of the book.

Collaboration

The entire class as well as the nine groups had numerous meetings throughout the entire semester (both face-to-face and via VICTORY) to discuss and make decisions on issues relating to their book. Issues discussed included the book title, the writing style of the book, the characters in the book, the publication schedule of the book, the marketing strategies of the book, etc. This is the Virtual Corporation part of VICTORY. The entire class worked as a team under the leaders (group leaders, class leader as well as the professor) to get the book published.

CMC Characteristics of VICTORY

VICTORY was developed with an aim to create an electronic learning environment which promotes conversations among professor and students as well as true collaboration (vs. assembly line approach to group project) among students (Note 3).

An analysis of the communications conducted within VICTORY revealed its multi-directional, hierarchical, individualized, asynchronous and auto-recording characteristics.

Multi-directional conversation

In traditional classrooms, conversation is usually one-way communication, i.e., from the instructor to the class as a whole. The conversations on VICTORY are multi-directional because not only is there two-way communication between teacher and students, there is also communication among students themselves. Figure 4 shows the communication patterns of VICTORY.

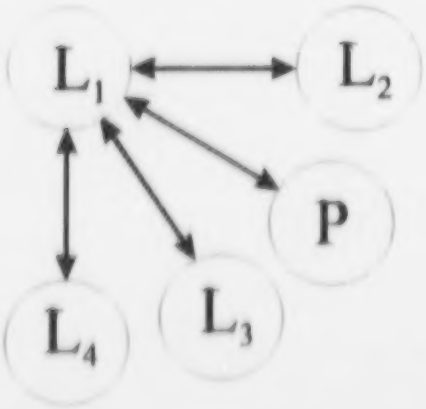

Figure 4. Two-way communication among professor and learners
(Using L_1 as an example)

Almost all of the contents of these communications are directly related to the cases studied and the book they are going to get published. The professor can send messages to an individual student, a whole group or the whole class. Figure 5 was part of the professor's email address book. Students (individual student, leaders representing groups or the class) also can send messages to the professor at a high frequency rate. And most importantly, students sent messages to each other to discuss, debate, reflect and construct. They could send messages via email to the professor, another classmate, a certain group of classmates, or they can choose to post their messages on the WWW for public attention.

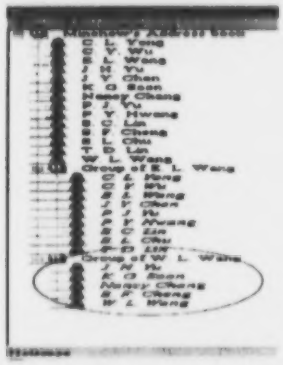

Figure 5. Example of professor's email address book
(The highlighted part indicates he was trying to send email to an entire group)

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Hierarchical conversation

This specifically refers to students' discussions on WWW. For each case studied, the teacher posted a discussion outline in the format of 4-8 open-ended questions on WWW and required students to post their responses after they finished reading the case profile. Their responses were to be arranged in a hierarchical order showing their relationships. For example, figure 6 below depicted discussions among learners #1, #2, #3 and #4 as well as the professor. Learner #1 responded to a question. Later, learner #2 did not agree with what learner #1 said, and made a comment on learner #1's response (arrow 1). A few hours later, learner #1 read #2's comments, and felt #2 misunderstood her meaning, so she again posted a response to #2 (arrow 2). Later, learner #3 examined the entire debate between #1 and #2, and felt he also had something to say about their debate, so he posted his comments (arrow 3). Then learner #4 came to WWW and felt she had something to say about learner #3's comments. So she did (arrow 4). And even later, the professor showed up on WWW and commented on the entire interaction (arrow 5). Of course, the discussions might very possible continue.

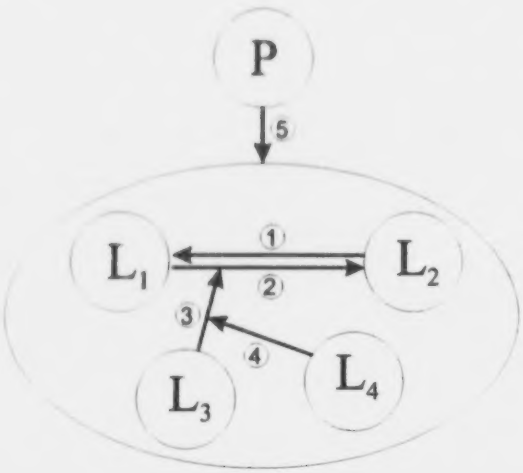

Figure 6. Discussion flows among learners and the professor

The web site was designed to show these back-and-forth conversation structures. Alignments and indentations were employed strategically to

represent the hierarchical order described above. With this hierarchical design and the log information of posted messages (post day, post time, post person, subject of the post message), it is convenient to sort out the back- and –forth conversations among learners (See figure 7).

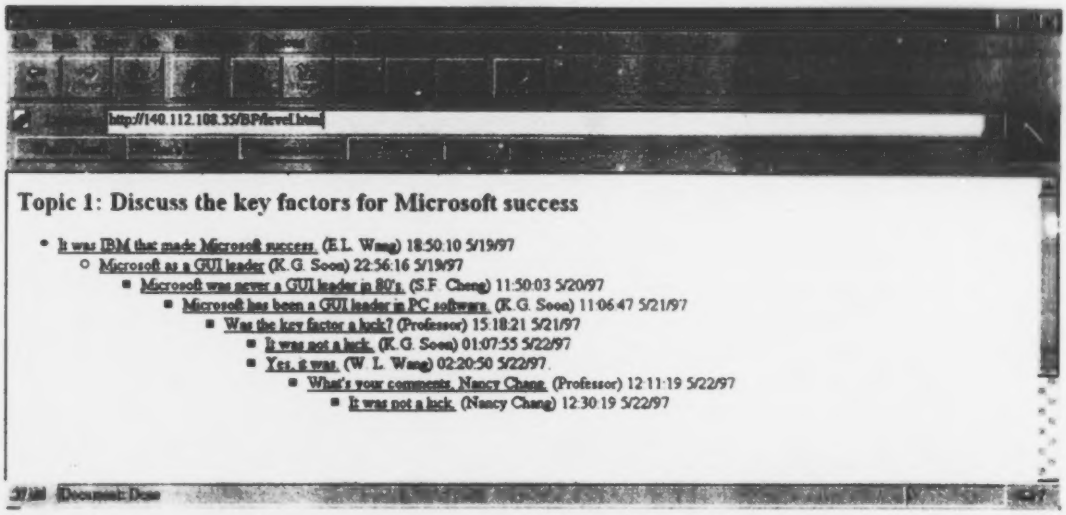
Topic 1: Discuss the key factors for Microsoft success
It was IBM that made Microsoft success. (E.L. Wang) 18:50:10 5/19/97
Microsoft as a GUI leader (K.G. Soon) 22:56:16 5/19/97
Microsoft was never a GUI leader in 80's. (S.F. Cheng) 11:50:03 5/20/97
Microsoft has been a GUI leader in PC software. (K.G. Soon) 11:06:47 5/21/97
Was the key factor a luck? (Professor) 15:18:21 5/21/97
It was not a luck. (K.G. Soon) 01:07:55 5/22/97
Yes, it was. (W.L. Wang) 02:20:50 5/22/97.
What's your comments, Nancy Chang. (Professor) 12:11:19 5/22/97
It was not a luck. (Nancy Chang) 12:30:19 5/22/97

Figure 7 A log excerpt of hierarchical discussions

Individualized conversation

In traditional classrooms, students are usually treated by the professor as an intact group. In VICTORY, students can receive their professor's individualized attention by sending emails. The turn around rate is usually very quick. Students no longer have to wait until the following week's class meeting or the once-a-week office hour. They can usually receive a teacher's response within 24 hours after sending their email. Students can also conduct individualized conversations with other classmates.

Asynchronous conversation

In traditional classrooms, two parties conducting conversations must be in the same time and in the same place, i.e., usually the class meeting time

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and room. This synchronous communication is a major reason why students often do not want to have out-of-class discussions. To get 59 students who take different courses, live separately, have different extra-curriculum activities and schedules together for a meeting is a major task in itself. But VICTORY provides possibilities for asynchronous conversation. Participants can send and receive messages at the time and the place most convenient to them. Student A might post her ideas on WWW in the morning from her apartment. Student B might post his comments toward A in the afternoon from the university computer lab. Student C might critique on the debate in the evening from yet another place. The apparent convenience of this asynchronous communication makes out of class conversation and collaboration feasible.

Conversations are auto-recorded

If communications are conducted orally (e.g., face-to-face meetings, discussing over the phone, etc.), the content of the communication will vanish when the discussion is over unless through special arrangement (e.g., have some one take notes of the conversation). But if the communications are conducted via email or WWW, the content of the communication will be recorded automatically. And the electronic record can be retrieved and edited for future publication.

Survey of student satisfaction with using CMC in Business Policy

Subjects and Procedure

At their last class meeting for the semester, an anonymous, traditional paper-and-pencil questionnaire was administered to 59 students to evaluate their satisfaction with integrating CMC in Business Policy course. Questionnaires were collected immediately after being answered. There were 45 valid questionnaires. The return rate was 76.2%. A brief

description of these 45 subjects follows. They were all senior students of the Department of Business Administration at National Taiwan University. They all took Business Policy course in the spring of 1997 from the second author. There were more female than male students (27 female, 16 male, 2 missing data) The majority of these students (N=36) had their own personal computers. Most of them (N=14) used ISP account to get on WWW, others used the network at the university dormitory (N=11), or university computer center's account (N=9), or computers at university labs (N=5) or others. Most of them (N=38) were experienced in using Internet before taking this course. Most of them (N=14) spent 3 to 6 hours on the Internet every week, some spent less than 3 hours (N=9), others spent more than 6 hours (N=20, 2 missing data). When asked what was their favorite learning style, most of them (N=23) selected CMC learning style (i.e., as adopted by this course), 11 preferred to learn independently, 5 still preferred the traditional way of instruction (2 missing data).

Instrument

A 19-item Likert scale questionnaire was developed by the researcher to survey students' satisfaction with using CMC in Business Policy course. Its Cronbach Alpha was .9328. The item analysis report and Cronbach Alpha value was summarized in table one. The 19-item questionnaire is included in the appendix.

Table 1. Item analysis results and Cronbach Alpha of the questionnaire

Item #	Pearson's r between Item and scale scores	One-tailed p	Critical Ratio	One-tailed p
1	.3524	.012	1.77	.048
2	.5326	.000	2.71	.012
3	.5970	.000	3.58	.002
4	.4940	.001	2.65	.018
5	.7770	.000	6.16	.000
6	.7289	.000	3.95	.003

Item #	Pearson's r between Item and scale scores	One-tailed p	Critical Ratio	One-tailed p
7	.7916	.000	4.71	.001
8	.7337	.000	5.57	.000
9	.4826	.001	1.86	.041
10	.3847	.007	2.68	.008
11	.6304	.000	2.68	.008
12	.8028	.000	5.71	.000
13	.6052	.000	3.78	.001
14	.7464	.000	3.96	.001
15	.8153	.000	9.17	.000
16	.8426	.000	14.55	.000
17	.8028	.000	8.76	.000
18	.8587	.000	10.09	.000
19	.7653	.000	6.28	.000
Cronbach Alpha = .9328 (N=41, 19 items)				

Analysis Results and Discussion

Questionnaire data were analyzed using SPSS/PC plus (Statistical Package for the Social Sciences) software. Findings were reported as follows.

Finding 1.

Generally speaking, subjects expressed positive attitude toward integrating CMC learning style in the course. There were 19 items on the scale. Each item scored from 1 to 5. The higher the score, the more positive the students' attitude. The highest possible score would be 95 points. And the average score was 69.59, equivalent 3.66 out of a 5-pt scale. All 19 items had average scores above the mean of 3. The percentages of subjects selecting Agree and Strongly Agree obviously outnumbered those choosing Disagree and Strongly Disagree. The detailed statistics were summarized in Table 2.

Table 2. Subjects' positive attitude toward integrating CMC in the course

Item No	Strongly Disagree (Valid %)	Disagree (Valid %)	Neutral (Valid %)	Agree (Valid %)	Strongly Agree (Valid %)	N	Mean (out of 5 pts)	Standard Deviation
1	0	6.7	0	68.9	24.4	45	4.11	.71
2	0	13.3	17.8	64.4	4.4	45	3.60	.78
3	2.2	24.4	6.7	60.0	6.7	45	3.44	1.01
4	0	4.4	4.4	71.1	20.0	45	4.07	.65
5	0	13.3	4.4	37.8	44.4	45	4.13	1.01
6	2.2	11.1	13.3	46.7	26.7	45	3.84	1.02
7	2 2	8.9	11.1	60.0	17.8	45	3.82	.91
8	0	4.4	13.3	48.9	33.3	45	4.11	.80
9	0	25.0	15.9	45.5	13.6	44	3.48	1.02
10	0	16.7	14.3	50.0	19.0	42	3.71	.91
11	0	7.0	4.7	55.1	25.3	43	4.05	.75
12	2.3	9.3	9.3	48.8	30.2	43	3.95	1.00
13	0	2.3	11.6	58.1	27.9	43	4.12	.70
14	0	7.0	2.3	65.1	25.6	43	4.09	.75
15	0	16.3	7.0	53.5	23.3	43	3.84	.97
16	0	11.6	16.3	48.8	23.3	43	3.84	.92
17	0	11.6	14.0	51.2	23.3	43	3.86	.91
18	0	11.6	7.0	58.1	23.3	43	3.93	.88
19	0	4.7	16.3	48.8	30.2	43	4.05	.82

Finding 2.

Students were most satisfied with CMC because it facilitated out-of-classroom communication among learners and the instructor. A majority of the subject (93.3%) also appreciated being pushed to work harder on learning materials by CMC arrangement. The four items of highest average score are as follows.

5 (M=4.13): This course has provided me a lot more opportunities to interact with my classmates than other courses.

#13 (M=4.12): WWW's capability of enabling communications among classmates with different views interests me.

8 (M=4.11): I feel I am noticed and recognized by my instructor when I read his responses toward my perspectives on WWW.

1 (M=4.11): Because I am required to participate in computer-mediated discussions, I have spent a lot of time trying to thoroughly understand the case!

Finding 3.

Students using different methods to get on the WWW had different degrees of satisfaction toward integrating CMC in the course. There were mainly four different methods for students to get on the WWW. Students could use university dormitory networks to get on the WWW, or use ISP (Internet Service Provider) account to get on the WWW from out of campus. They could also use university-owned computers on campus to get on the WWW, or try to dial through the accounts provided by the university computer center off campus. The first two methods (dormitory and ISP) tended to result in more successful, smooth experiences of getting on WWW than the last two methods (university computers and dial through university computer center's account). During the entire semester, students using the last two methods frequently expressed difficulties getting on the WWW (they called it "jam") because of several reasons. First, not all computers on campus could be linked to WWW. Second, computers on campus were not as powerful as desired. Third, there usually was not enough software on university-owned computers to allow students to finish their assignment successfully. And the accounts provided by the university computer center were not as many as desired. Students complained that they usually had to wait for a long time to get on the WWW, and the failure rate was high. An email sent out by Y. W. Yong, a female student who used university computer center's account to get on WWW, vividly described her stressful experience.

Subject: A prayer
Date: Thursday, 24 Apr 1997
From: Y. W. Yong b2406013@ms.cc.ntu.edu.tw
To: Min-chow Hong minchow@handel.mba.ntu.edu.tw

Dear teacher:

I have been waiting unbelievably long to get the phone call through. I have been praying humbly to God. "Please don't let WWW at NTU (National Taiwan University) have traffic jam or else I won't be able to get connected." "Please don't let WWW kick me out once I get on. (The line will be shut down automatically if idle longer than 10 minutes.)" Now I feel worse than when I started out tonight. I have a temperature as high as a volcano bursting out lava that I can't think straight. My eyes are so dry and they hurt because I've been staring at the computer screen for too long. I have a running nose and I lost my voice.

If I can't get recovered by Friday, I might have to ask a sick leave from your class. And please forgive me for sending my answers via e-mail (instead of WWW). I don't have the energy to fight with NTU WWW any more. I'll give it a try again tomorrow morning. If it still doesn't work, I'll just give up. I've drawn an organization chart, but never had the good luck to have it posted on WWW.

Excerpt from Hong (1997a) p81.

Student's t-tests showed that subjects who had a more successful, smoother experience getting on the WWW had significantly higher satisfaction toward using CMC than students who failed or had a painstakingly-long-waiting-time experience ($t=2.37$, $p=.012$). This is an important lesson for those educators who wish to integrate CMC in their instruction. Students' accessibility to a designed computer environment was a key factor to their satisfaction.

Finding 4.

Students who preferred CMC learning style showed significantly higher satisfaction than those who were in favor of other learning styles (i.e.,

independently-learning, traditional lectures) (t=2.37, p=.004). This finding didn't come as a surprise for the obvious relationship between the two.

Finding 5.

There was no gender difference in terms of students' satisfaction toward integrating CMC in the course (t=.08, p=.939). Both female (3.66 out of a 5-pt scale) and male students (3.67 out of a 5-pt scale) showed positive attitudes. This finding was very encouraging to educators. Females in this study were not afraid of, nor rejected using CMC. However, the writer must remind readers these female students (as well as male students) were elite students in Taiwan. Their college entrance examination scores had to be at the very top in order to gain admission to this department and this university. This finding might not be able to be generated to students of different academic aptitudes/achievements.

Conclusion and Recommendation

A Computer-Mediated Communication (CMC) device, Virtual Classroom & Virtual Corporation System (VICTORY) was developed and integrated in the second author's Business Policy course at National Taiwan University in the spring semester of 1997. The classroom communication pattern and collaborative learning situation were dramatically different than those of the traditional classroom. Multi-directional communications, hierarchical discussions, individualized and asynchronous communications were conducted either on the cases studied or on the group project (publishing a book). Students no longer wasted their youth memorizing factual information. Instead, they learned to think, to articulate their thoughts, to criticize other views, to defend or modify their own positions when challenged, and to negotiate meaning with their classmates. Group project was no longer treated as piece meal. The whole group (class) had to work together closely to solve problems, make crucial decisions, meet schedules and to get the book published on their commencement. That shows true collaboration.

A questionnaire survey of students' satisfaction with integrating CMC

in Business Policy revealed five important findings. Generally speaking, subjects expressed positive attitudes toward integrating CMC learning style in the course. Students were most satisfied with CMC because it facilitated out-of-classroom communication among learners and the instructor. Subjects who had a more successful, smoother experience getting on the WWW had significantly higher satisfaction toward using CMC than students failed to get on the WWW or had a painstakingly-long-waiting-time experience. Students preferring CMC learning style showed significantly higher satisfaction than those who were in favor of other learning styles (i.e., independently-learning, traditional lectures). And there was no gender difference in terms of these elite students' satisfaction toward CMC.

Recommendations to educators who wish to integrate CMC and Constructivism in their classroom teaching

One important key factor of successful integration of CMC in classroom teaching is for professor and learners to have easy access (physically and psychologically) to the computer network. The roles played by professor and students are dramatically different from those in the traditional classroom. The professor's role should change from "Sage on the stage" to "Facilitator on the side". The professor should also respond to individual students without unnecessary delay. While the students' role should change from "absorbing knowledge from the professor" to "constructing their own knowledge".

Recommendations to educators who wish to conduct CMC and Constructivism related research

There is no one best way to teach all students. Though the subjects in this study generally expressed satisfaction, we still do not think the CMC and Constructivism type of teaching (as the one described in this paper) apply to all students, in all subject areas, for all knowledge of different degrees (beginning vs. advanced). Aptitude-Treatment Interaction (ATI) type of

studies were encouraged to find out ideal matches between student's aptitude and instructional treatment.

Note 1:

The two writers are both experienced teachers in Taiwan higher education institutions. The first author has 8 years teaching experience at a teachers College; while the second author has taught at two different universities for a total of 15 years

Note 2:

The authors wish to acknowledge Woody Wang for his professional assistance in creating figures in this paper.

Note 3:

The URL address for VICTORY is http://140.112.108.35/BP/index.htm. VICTORY is a Chinese web site supported by Big-5 code only.

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Appendix. <<Student satisfaction with integrating CMC in Business Policy>> Questionnaire

Instruction: Please choose one from SD, D, N, A, and SA.(SD: Strongly Disagree; D: Disagree; N: Neutral; A: Agree; SA: Strongly Agree)

	SD	D	N	A	SA
1. Because I'm required to participate in computer-mediated discussions, I have spent a lot of time trying to thoroughly understand the case!	☐	☐	☐	☐	☐
2. I feel like communicating more frequently with my instructor because of his instructional arrangement of this course.	☐	☐	☐	☐	☐
3. I use WWW to discuss cases with my classmates often.	☐	☐	☐	☐	☐
4. I believe I have learned a lot from this CMC learning environment.	☐	☐	☐	☐	☐
5. This course has provided me a lot more opportunities to interact with my classmates than other courses.	☐	☐	☐	☐	☐
6. I feel I'm closer to my instructor under this CMC learning environment.	☐	☐	☐	☐	☐
7. The discussions conducted prior to the class on WWW makes me understand more what my instructor is trying to get across in the class.	☐	☐	☐	☐	☐
8. I feel I am noticed and recognized by my instructor when I read his responses toward my perspectives on WWW.	☐	☐	☐	☐	☐
9. I spent a lot of time searching for information relating to the cases and project of this course on Internet.	☐	☐	☐	☐	☐
10. I still use traditional ways (e.g., telephone, face to face communication) to discuss cases with my classmates often.	☐	☐	☐	☐	☐
11. I have spent a lot of time conducting discussions related to this course with my classmates.	☐	☐	☐	☐	☐
12. This course has provided me a lot more opportunities to interact with the instructor than other courses.	☐	☐	☐	☐	☐
13. WWW's capability of enabling communications among classmates with different views interests me.	☐	☐	☐	☐	☐
14. My understandings of the corporations studied in the cases become more complete through CMC.	☐	☐	☐	☐	☐
15. I am satisfied with my learning outcome in this course.	☐	☐	☐	☐	☐
16. I am satisfied with my interaction with the instructor.	☐	☐	☐	☐	☐
17. I am satisfied with my interaction with my classmates.	☐	☐	☐	☐	☐
18. Generally speaking, I am satisfied with this course.	☐	☐	☐	☐	☐
19. I am willing to recommend others to take this course.	☐	☐	☐	☐	☐